



STGE50NB60HD

N-CHANNEL 50A - 600V ISOTOP PowerMESH™ IGBT

PRELIMINARY DATA

| TYPE | V _{CES} | V _{CE(sat)} | I _C |
|--------------|------------------|----------------------|----------------|
| STGE50NB60HD | 600 V | < 2.8 V | 50 A |

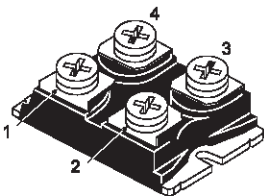
- HIGH INPUT IMPEDANCE (VOLTAGE DRIVEN)
- LOW ON-VOLTAGE DROP (V_{CESAT})
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- VERY HIGH FREQUENCY OPERATION
- OFF LOSSES INCLUDE TAIL CURRENT
- CO-PACKAGED WITH TURBOSWITCH™ ANTIPARALLEL DIODE

DESCRIPTION

Using the latest high voltage technology based on a patented strip layout, STMicroelectronics has designed an advanced family of IGBTs, the PowerMESH™ IGBTs, with outstanding performances. The suffix "H" identifies a family optimized to achieve very low switching times for high frequency applications (<120kHz).

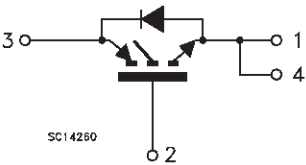
APPLICATIONS

- HIGH FREQUENCY MOTOR CONTROLS
- WELDING EQUIPMENTS
- SMPS AND PFC IN BOTH HARD SWITCH AND RESONANT TOPOLOGIES



ISOTOP

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Value | Unit |
|---------------------|---|------------|------|
| V _{CES} | Collector-Emitter Voltage (V _{GS} = 0) | 600 | V |
| V _{GE} | Gate-Emitter Voltage | ± 20 | V |
| I _C | Collector Current (continuous) at T _c = 25 °C | 100 | A |
| I _C | Collector Current (continuous) at T _c = 100 °C | 50 | A |
| I _{CM} (•) | Collector Current (pulsed) | 400 | A |
| P _{tot} | Total Dissipation at T _c = 25 °C | 300 | W |
| | Derating Factor | 2.4 | W/°C |
| T _{stg} | Storage Temperature | -65 to 150 | °C |
| T _j | Max. Operating Junction Temperature | 150 | °C |

(•) Pulse width limited by safe operating area

STGE50NB60HD

THERMAL DATA

| | | | | |
|-----------------------|-------------------------------------|-----|-------|------|
| R _{thj-case} | Thermal Resistance Junction-case | Max | 0.416 | °C/W |
| R _{thj-amb} | Thermal Resistance Junction-ambient | Max | 30 | °C/W |
| R _{thc-h} | Thermal Resistance Case-heatsink | Typ | 0.1 | °C/W |

ELECTRICAL CHARACTERISTICS (T_j = 25 °C unless otherwise specified)

OFF

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|----------------------|--|---|------|------|-------------|----------|
| V _{BR(CES)} | Collector-Emitter Breakdown Voltage | I _C = 250 μA V _{GE} = 0 | 600 | | | V |
| I _{CES} | Collector cut-off (V _{GE} = 0) | V _{CE} = Max Rating T _j = 25 °C V _{CE} = Max Rating T _j = 125 °C | | | 100 1000 | μA μA |
| I _{GES} | Gate-Emitter Leakage Current (V _{CE} = 0) | V _{GE} = ± 20 V V _{CE} = 0 | | | ± 100 | nA |

ON (*)

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|----------------------|--------------------------------------|--|------|------------|------|--------|
| V _{GE(th)} | Gate Threshold Voltage | V _{CE} = V _{GE} I _C = 250 μA | 3 | | 5 | V |
| V _{CE(SAT)} | Collector-Emitter Saturation Voltage | V _{GE} = 15 V I _C = 50 A V _{GE} = 15 V I _C = 50 A T _j = 125 °C | | 2.3 1.9 | 2.8 | V V |

DYNAMIC

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|--|---|---|------|-------------------|------|----------------|
| g _{fs} | Forward Transconductance | V _{CE} = 25 V I _C = 50 A | | 22 | | S |
| C _{ies} C _{oes} C _{res} | Input Capacitance Output Capacitance Reverse Transfer Capacitance | V _{CE} = 25 V f = 1 MHz V _{GE} = 0 | | 4500 450 90 | | pF pF pF |
| Q _G Q _{GE} Q _{GC} | Total Gate Charge Gate-Emitter Charge Gate-Collector Charge | V _{CE} = 480 V I _C = 50 A V _{GE} = 15 V | | 260 28 15 | | nC nC nC |
| I _{CL} | Latching Current | V _{clamp} = 480 V R _G = 10 Ω T _j = 150 °C | 200 | | | A |

SWITCHING ON

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|--------------------------------------|--------------------------|---|------|----------|------|----------|
| t _{d(on)} t _r | Delay Time Rise Time | V _{CC} = 480 V I _C = 50 A V _{GE} = 15 V R _G = 10 Ω | | 20 70 | | ns ns |
| (di/dt) _{on} | Turn-on Current Slope | V _{CC} = 480 V I _C = 50 A R _G = 10 Ω V _{GE} = 15 V | | 350 | | A/μs |
| E _{on(▷)} | Turn-on Switching Losses | T _j = 125 °C | | 950 | | μJ |

ELECTRICAL CHARACTERISTICS (continued)**SWITCHING OFF**

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|--------------------|-------------------------|---|------|------|------|------|
| t_c | Cross-Over Time | $V_{CC} = 480 \text{ V}$ $I_C = 50 \text{ A}$ | | 166 | | ns |
| $t_r(V_{off})$ | Off Voltage Rise Time | $R_{GE} = 10 \Omega$ $V_{GE} = 15 \text{ V}$ | | 48 | | ns |
| $t_d(off)$ | Delay Time | | | 326 | | ns |
| t_f | Fall Time | | | 90 | | ns |
| $E_{off}(^{**})$ | Turn-off Switching Loss | | | 2.1 | | mJ |
| $E_{ts}(^{\circ})$ | Total Switching Loss | | | 3 | | mJ |
| t_c | Cross-Over Time | $V_{CC} = 480 \text{ V}$ $I_C = 50 \text{ A}$ | | 270 | | ns |
| $t_r(V_{off})$ | Off Voltage Rise Time | $R_{GE} = 10 \Omega$ $V_{GE} = 15 \text{ V}$ | | 75 | | ns |
| $t_d(off)$ | Delay Time | $T_j = 125 \text{ }^{\circ}\text{C}$ | | 340 | | ns |
| t_f | Fall Time | | | 200 | | ns |
| $E_{off}(^{**})$ | Turn-off Switching Loss | | | 2.9 | | mJ |
| $E_{ts}(^{\circ})$ | Total Switching Loss | | | 3.85 | | mJ |

COLLECTOR-EMITTER DIODE

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|-----------|--------------------------|--|------|------|------|------|
| I_f | Forward Current | | | | 50 | A |
| I_{fm} | Forward Current pulsed | | | | 400 | A |
| V_f | Forward On-Voltage | $I_f = 50 \text{ A}$ | | | | V |
| | | $I_f = 50 \text{ A}$ $T_j = 125 \text{ }^{\circ}\text{C}$ | | 2 | | V |
| t_{rr} | Reverse Recovery Time | $I_f = 50 \text{ A}$ $V_R = 200 \text{ V}$ | | 200 | | nS |
| Q_{rr} | Reverse Recovery Charge | $dI/dt = 100 \text{ A}/\mu\text{S}$ $T_j = 125 \text{ }^{\circ}\text{C}$ | | | | nC |
| I_{rrm} | Reverse Recovery Current | | | | | A |

(●) Pulse width limited by max. junction temperature

(\circ) Include recovery losses on the STTA2006 freewheeling diode

(*) Pulsed: Pulse duration = 300 μs , duty cycle 1.5 %

(**) Losses Include Also The Tail (Jedec Standardization)

Fig. 1: Gate Charge test Circuit

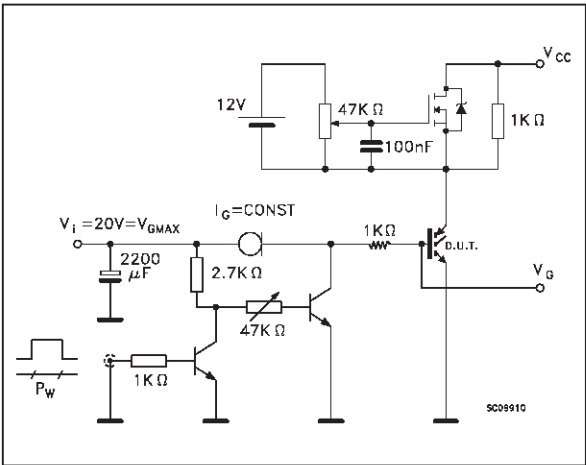


Fig. 2: Test Circuit For Inductive Load Switching

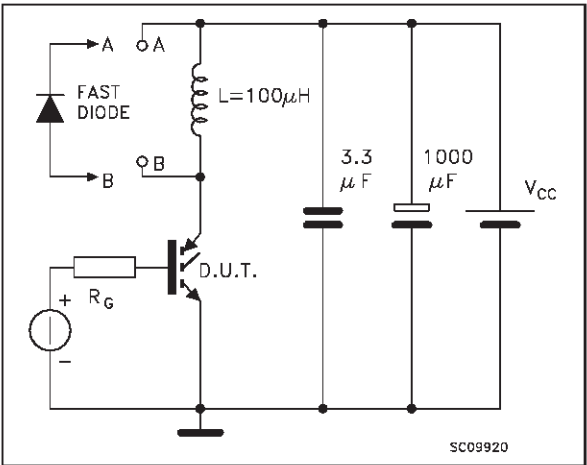
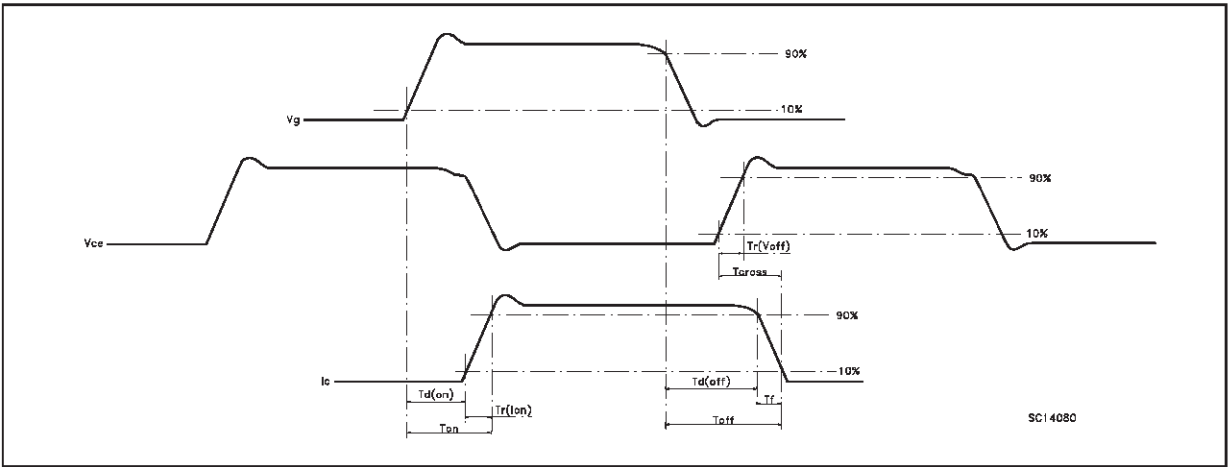
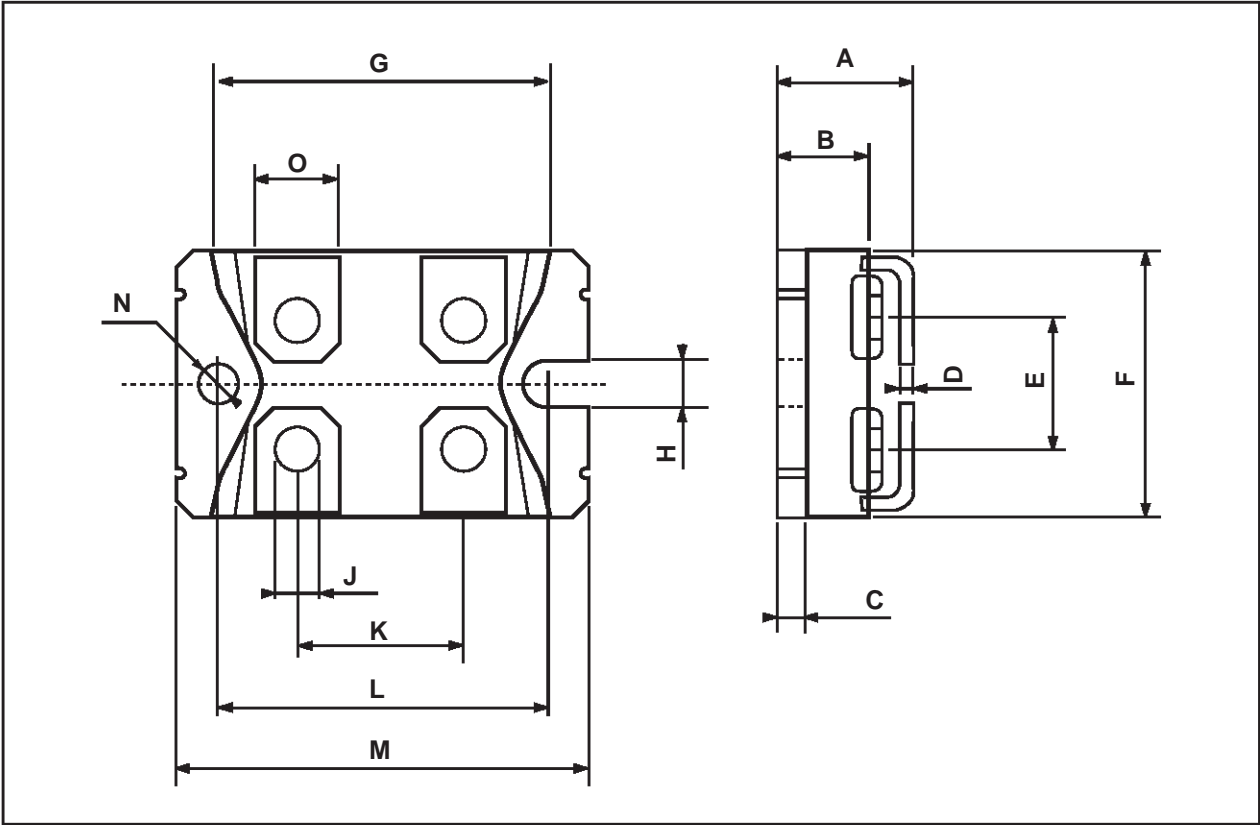


Fig. 3: Switching Waveforms



ISOTOP MECHANICAL DATA

| DIM. | mm | | | inch | | |
|------|-------|------|------|-------|------|-------|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | 11.8 | | 12.2 | 0.466 | | 0.480 |
| B | 8.9 | | 9.1 | 0.350 | | 0.358 |
| C | 1.95 | | 2.05 | 0.076 | | 0.080 |
| D | 0.75 | | 0.85 | 0.029 | | 0.033 |
| E | 12.6 | | 12.8 | 0.496 | | 0.503 |
| F | 25.15 | | 25.5 | 0.990 | | 1.003 |
| G | 31.5 | | 31.7 | 1.240 | | 1.248 |
| H | 4 | | | 0.157 | | |
| J | 4.1 | | 4.3 | 0.161 | | 0.169 |
| K | 14.9 | | 15.1 | 0.586 | | 0.594 |
| L | 30.1 | | 30.3 | 1.185 | | 1.193 |
| M | 37.8 | | 38.2 | 1.488 | | 1.503 |
| N | 4 | | | 0.157 | | |
| O | 7.8 | | 8.2 | 0.307 | | 0.322 |



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